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ABSTRACT

The naturalistic inquiry is premised on a story narrative to describe classroom experiences. In an ongoing dissertation research study into the teaching and learning of secondary science, classroom stories were constructed to portray a student's point of view. The student's classroom goals, roles, and expectations for the teacher are discussed. The student signals his discontent with the teacher's instructional strategies by acting out inappropriately in class. It is concluded that teachers and researchers can better understand the effectiveness of classroom instruction by understanding students' experienced and preferred goals and roles for themselves and their teachers. (Contains 15 references.) (Author)

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Student Stories in a High School Physics Class

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Abstract

The naturalistic inquiry is premised on a story narrative to describe classroom experiences. In an ongoing dissertation research study into the teaching and learning of secondary science, classroom stories were constructed to portray a student's point of view. The student's classroom goals and roles and his expectations for the teacher are discussed. The student signals his discontent with the teacher's instructional strategies by acting out inappropriately in class. It is concluded that teachers and researchers can better understand the effectiveness of classroom instruction by understanding students' experienced and preferred goals and roles for themselves and their teachers.

Purpose and Rationale

In the construction of this case study, I set out to make sense of one student's classroom experiences in a year 12 physics course. The goal is to construct meaning from classroom observations and interviews with one student called Frank (a pseudonym). More than 50 classroom observations and 18 interviews with Frank have guided my interpretative journey into Frank's learning environment.

This study grew out of my ongoing dissertation research designed to describe and interpret student constructions of their roles and goals in the classroom. This case study research enables authentic insights into classroom learning environments (Guba & Lincoln, 1989). Rather than suggest broad generalizations based on a large sample, I have chosen to interpret and describe the qualities of experience of one high school student.

Background

In the years immediately before and after *The Nation at Risk*, "more than a hundred national reports concluded that there is a crisis in American Education" (Hurd, 1986, p. 353). Hurd continues:

> Science has been singled out as a subject area in serious need of reform. From kindergarten through high school, science education is viewed as deficient in purpose, scope, and style of teaching. (ibid.)

In 1985, the National Resource Council reported that "evidence suggests an erosion over the last 20 years in average achievement test scores for the nation's students in both mathematics and science" (1985, p. 132). In a comparison of the National Assessment of

Educational Progress testing, scores for 17 year old students in the physical sciences have declined between the periods of 1969 - 1972, 1972 - 1976, and 1976 - 1981 (National Science Council, 1985). Despite these declines the College Board Admission Testing Program acknowledged mean physics scores remained relatively constant from 1976 to 1984 for college bound students (National Resource Council, 1985).

Although members of the National Resource Council claimed student tests have been "sufficiently valid for the purpose of indicating group achievement levels" (1985, p. 133). The Council recommended that testing instruments be reviewed from time to time to ensure "they assess student learning considered useful and important" (ibid.).

In this era of reform initiatives, what does it mean for the high school graduates who have experienced an inadequate science education? Students with a poor grasp of science content knowledge, the social and personal effects of science and technology, and higher order learning skills have been frequently labeled as scientifically illiterate. It is a commonly shared belief that persons who are scientific illiterate may encounter greater difficulties in gaining meaningful employment and these individuals may be less informed of the ramifications of their own decisions regarding health, technology, and the environment.

To help reverse the advancing tide of scientific illiteracy, the American Association for the Advance of Science issued *Project 2061: Science For All Americans* (1989). One of the recommendations contained within this report is quoted below.

> All Americans were deserving of a quality science education so they may become scientifically literate. The national council is convinced that - given clear goals, the right resources, and good teaching throughout 13 years of school-essentially all students will be able to reach all the recommended learning goals by the time they graduate from high school. (American Association for the Advancement of Science, p. 20)

In the initial phase of Project 2061, scientific content, processes, and higher order inquiry goals were elaborated across all science disciplines. However, creating national science education goals and content standards is more easily planned than enacted in the practical world of tardy bells and textbooks.

Roth and Roychoudhury (1994) say it well: "What happens in the classroom not only depends on how teachers conceptualize their roles, but also how students perceive and conceptualize their learning and the role of their teacher" (p. 5). Understanding students' conceptions of specific roles in classrooms is in part addressed by the kind of actions students' believe are appropriate in the context of their own classroom learning environment. According to Haertel et al., student views on learning are related to "student age, ability, and motivation; the quality and quantity of instruction; the social-psychological environment or morale of the class and home; the peer group environment; and exposure to mass media" (reported in Lawrenz & Welch, 1983, pp. 655-656). These factors also contributed to Frank's educational context. It is not in the scope of this paper to

provide a thick description of all of these factors rather I will touch on the salient factors that emerge from the observations and interviews.

Research Questions & Discussion

a) What are Frank's perceived goals and roles in a high school physics classroom?

b) What are Frank's preferences for his physics teacher's goals and roles?

I will examine the conversations between Frank and his teacher and construct Frank's interpretations of these conversations. This implies interpreting Frank's language beyond merely recording and transcribing his words. The initial step in understanding Frank's experience is to situate his experience in his own life-world. This requires a deep level of understanding and trust between Frank and me.

Roth and Roychoudhury (1994) questioned, surveyed, and interviewed 42 high school physics students to find out their views on learning, knowledge, and epistemologies. These researchers suggested, "Students emphasize work completion, getting the right answers, and receiving satisfactory grades" (1994, p. 6). I interpreted these attitudes as goals which influence subsequent student actions.

In a study of freshman high school students across various subjects, Allen (1986) summarized, "Students had two major classroom goals: to socialize and to pass the course" (p. 445). Allen reported students engaged in specific strategies, which I call roles, to achieve their goals. Student roles included: figuring out the teacher,

having fun, giving the teacher what (s)he wants, minimizing work, reducing boredom, and staying out of trouble (ibid.).

In the context of a working class school in the United Kingdom, Dubberley (1988) concluded humor was a prime goal of students. Humor was used by students to test teachers and determine whether or not teachers were 'above themselves'. The 'lads and lasses' roles in this secondary school environment were to offer resistance through humor to see if their teacher was 'all right'. From the students' views, teachers were suppose to be able to take a joke and be able to 'stand up for themselves'. Teachers' perceived as weak were unmercifully ridiculed by these students. Humor in this context cut through the mock seriousness of the school environment which was foreign to these children of coal miners. "Humor was seen to highlight the gulf between the values of the working class culture of the students and the middle class upraising of their teachers" (Dubberley, p. 21).

Methods

I was a participant observer for more than 90 hours in one high school physics classroom during a 12 week trimester period. This is equivalent to nearly one entire academic year. During class, I sat at a student desk and entered notes in my Powerbook while blending into the background. Interactions with students were minimized during whole group teacher centered instruction. When students were doing group work, I frequently walked about the room and spoke with students at their seats to find out what they were doing. Occasionally, students came up to me at my desk and asked questions. At these times, I tutored students if they wanted

help in solving a physics problems. Students also came up to read what I was writing. Thus there were two kinds of questions students asked me during class, one set of questions involved helping them with their physics problems and the other related to finding out what I was writing.

I also spoke briefly with students on an individual basis after the dismissal bell sounded in brief hallway conversations. The teacher handed outs tests, course syllabus, student contract, and project descriptions. I asked the teacher what his goals were for student learning; however, I limited contact with the instructor both during and after regular class hours to maintain the trust and confidence of students (Allen, 1986).

I conducted a series of 45 and 90 minute semi-structured interviews with Frank and three other students after class in an otherwise empty science classroom. Students were compensated five dollars per hour for participating in interview sessions. I interviewed Frank and one other student for 15 hours. Another 5 hours was invested in one-to-one interviews with Frank. About one half of the interview sessions were audio recorded and transcribed into text. During interviews Frank discussed his roles and goals, perceptions of the teacher's roles and goals, the learning environment, what he was learning in class, the rationale behind his classroom actions, his views on the physics teacher's actions, and general biographical information.

During interview sessions I questioned students to facilitate and guide discussions to include my research questions; however, I let students speak on other issues as well as the issues I brought to

the interviews. Ellis says it well, "The interviewer's role is to communicate genuine curiosity, respect, and acceptance" (1994, p. 370). I fostered a professional relationship emphasizing rapport (Glesne, 1989) through connectedness (Belenky, Clinchy, Goldberger, & Tarule, 1986). I maintained a caring attitude towards students and thought of them as persons (Noddings, 1984) to facilitate meaningful discussion.

I met with Frank for one follow-up hour session after the conclusion of the physics course. During this session, I asked Frank to review, critique, and offer a short summary of my story which follows. This was my member check with the participant represented in this story. I sought a negotiated consensus to facilitate the construction of authentic and truthful stories (Guba & Lincoln, 1989).

About Reporting

Eisner suggests qualitative researchers "create in the public world a structure or form whose features re-present what is experienced in private" (1991, p. 89). I seek to create stories and tell them in a way to enable the reader to vicariously enter a physics classroom and experience what students experience.

Stories offer opportunities to connect with our own experiences and the experience of others. Our storied lives result from and, in turn, give meaning to our interpretations of experience. Your stories enter into your construction of this text as you read it. Richardson (1990) adds "people make sense of their lives through the stories that are available to them, and they attempt to fit their lives into the available stories. People live by stories" (p. 26).

Stories blur the distinction between fiction and nonfiction. They are truthful fictions. "There is no telling it like it is" writes Eisner, "for in the telling there is the making" (1991, p. 191). Stories are nonfiction since living beings will be interviewed and observed in a particular space and time. They also have a fictional quality as I describe, analyze, and interpret student actions, primarily language, based on interview transcripts, participant observation notes, and classroom documents. Denzin describes this dualism between narrative as fiction and nonfiction as, "A truthful fiction (narrative) is faithful to facticities and facts. It creates verisimilitude, or what are for the reader believable experiences" (1989, p. 23).

The Story

CLASSROOM SPARRING AND RED WARNING LIGHTS

In a playful yet serious tone, Frank asked, "Were we suppose to use significant digits in our answers?" Mr. Benson fired back in one exasperated breath "No Frank, I just wanted you to do it for the heck of it". Frank grinned, twisted around in his chair and glanced down at his physics text. Frank would include the 'official' number of significant digits in his answers even though he didn't know what made the numbers significant. He didn't really feel like bothering with significant figures, there were too many velocity problems assigned and determining significant figures meant additional work.

Frank wasn't bothered by Mr. Benson's remark. He took a General Science class with Mr. Benson three years ago and knew this

teacher had a history of joking with students. Mr. Benson's cutting comment did not make Frank mad nor upset, rather in Frank's mind the joking made class more enjoyable. Having a teacher who joked entertained the class. However in Franks mind if a teacher made cutting remarks to a student, then the student had a right to reciprocate.

The reasons for using significant digits may have been listed in his physics textbook but Frank hadn't read the homework assignment from the night before. He cleaned offices yesterday after school and later went to a basketball game. Arriving home at 10:30, he was too tired to think about physics.

Frank liked to ask questions in class. That's how he learned things, by asking the teacher questions and having the teacher ask him questions to see what he knew. Frank liked it when science and mathematics teachers took the time to explain things and illustrated concepts and problems on the chalkboard or overhead. He also liked science teachers who incorporated laboratory activities and meaningful science projects in their lesson plans.

Frank searched through his textbook and sure enough, there were rules for determining the correct number of significant digits when multiplying, dividing, adding, and subtracting. Yet Frank remained frustrated since Mr. Benson had not explained why significant figures were important. His frustration was directed at Mr. Benson's teaching.

After Frank's question about using significant figures, the only noticeable sounds in class were the drumming of an eraser and the

wrinkling of textbook pages. Then after about 20 minutes Frank spoke suddenly, "Mr. Benson, why are significant figures important?".

Mr. Benson looked up from the papers he was reading at the front podium and responded in a mild monotone: "The answer for your question is in your textbook, look it up".

"But why don't you just tell me why Mr. Benson?" asked Frank.

Mr. Benson stated, "Because I know you are smart enough to figure it out for yourself.

So look it up."

"OhhhhhKaaaay" Frank playfully exaggerated.

This dialog between Frank and Mr. Benson foreshadowed the nature of their relationship for the remainder of the course. Classroom sparring was comical yet dark side like the irony found in Joseph Heller's novel: *Catch 22*.

Beneath the surface of the sparring between Frank and Mr. Benson existed a concealed message. This message resulted from Frank's frustration, irritation, and annoyance with Mr. Benson's teaching style. Frank was signaling like a red electric light. The signal spelled out in smooth curved lines: Mr. Benson, teach me in a way that helps me learn! Mr. Benson's teaching practices were inconsistent with the kinds of instruction Frank preferred. As the trimester progressed there was an ever widening gap between Frank's experienced and preferred learning environment. In time, the red light flashed brighter and longer.

I did not immediately notice the warning light. I eventually constructed the message five weeks into the course when a conflict irrupted concerning playing background music in class. During a

lengthy debate between Mr. Benson and a number of students about the pro's and con's of listening to background music, Mr. Benson admitted, "Well I'll say one thing, you are certainly entertaining". Frank countered, "Well at least we get something out of class". Flash!

Frank's expectations of his teacher were not being realized. Textbook problems and an occasional video were fine, but without adequate classroom instruction, Frank was resigned to the fact that the teacher was not going to take an active role in teaching the students.

On another occasion, a videotape was going to be shown illustrating mechanics principles. As Mr. Benson walked towards the TV/VCR with tape in hand Frank exclaimed, "Mr. Benson is the man on the video going to teach us today?" Mr. Benson continued walking. "Well at least someone is going to teach us for a change" Frank finished. I stared into the glaring red light.

Eight weeks into the trimester, another dispute broke out between Mr. Benson and a few students concerning an upcoming assignment due date. After a few minutes of discussion, Mr. Benson paced to the front of the room and announced in mocking understatement: "So this is the first time I have stood here at the front of the room?" while pointing to the assignment written on the front board. The classroom became as quiet as a whisper. Then Frank announced "It is the first time you have stood up there Mr. Benson." The red light flashed again.

Frank joked while sending a serious message. He wanted Mr. Benson to spend more time at the front of the room reviewing problems with the class. During the 58 days of class instruction,

Frank and Mr. Benson engaged in many bouts of classroom sparring. They would direct sarcastic, even acrimonious comments at one another. Sparring often began with Frank asking a question followed by Mr. Benson's cutting response. On other occasions Frank would deliver a stinging statement or ask a biting rhetorical question. Sparring wasn't meant to be taken as an attack on one's character. Rather, it was a way of testing the teacher to see if he could take it, to see if the teacher was able to speak the students' language.

Sparring directed at Mr. Benson was often followed with student snickers and grins. Sparring had an entertaining effect for Frank. Entertainment was one of his goals in physics class. One of the roles which supported this goal was to crack jokes or to engage in silly classroom behavior. Like the time Frank hung a baby doll from the classroom ceiling.

There was a life sized baby doll on a spare table in the back of the classroom. On one occasion late in the trimester, Mr. Benson had been out of the room for about 5 minutes when Frank picked up the doll and tied a string around its neck and hung it from the ceiling. The diapered baby doll dangled at eye level, slowly twisting in the room with its tiny arms reaching into empty space. After Mr. Benson returned to the room he did not notice the baby doll for 10 minutes.

Frank's action was a sparring event. It was a symptom of a larger problem. Frank did not like the way Mr. Benson was conducting class. Frank did not want too much free, unsupervised time in class; he instinctively knew that when given the opportunity, he would get up out of his seat and engage in inappropriate classroom acts. He knew that hanging the baby doll was

inappropriate, however he did it because he figured Mr. Benson would not find out who did it, and it was humorous.

Mr. Benson gave students a large amount of free time to teach themselves from their textbook. Frank didn't care for that method of teaching. It gave him too much freedom. If Mr. Benson was not going to teach during the class period, then why should he be motivated to learn? It was too difficult to teach yourself how to solve physics problems. Mr. Benson was not living up to his contract. He asked students to do homework each night, but how much time did he spend preparing lessons, reviewing concepts, and setting up laboratory activities? In all fairness, the teacher ought to spend as much time preparing outside the class as students.

Frank signaled throughout the trimester. He wanted Mr. Benson to conduct class differently. Rather than expect students to basically teach themselves and give students an excessive amount of free time, Mr. Benson ought to conduct whole class, teacher centered activities including lecture, laboratories, and plenty of opportunities for questioning.

Frank had a goal of work avoidance yet he was willing to work if he felt the teacher was committed to his learning. As the trimester progressed, it became clearer to Frank that Mr. Benson was not too interested in teaching physics. Frank concluded that Mr. Benson was just too busy with other concerns to pay much attention to what was happening in class. He had not noticed the red warning light.

Assertions

Frank's Experienced Goals & Roles

#1. Goal-To Learn. Frank concluded he would learn regardless of the grade he was given. In fact, he believed grades did not always measure his learning adequately. Frank viewed learning as his prime goal as a student.

#1. Role-Frank's major role in achieving his goal to learn was to read and study the textbook and solve textbook problems.

#2. Goal-Earn a good grade.

#2. Role-Achieving this goal meant doing what the teacher wanted. However, if Frank wasn't interested or didn't have the proper kind of instruction he would do the minimal amount of work necessary to earn his desired grade. Another reason for doing what Mr. Benson wanted was to avoid getting in serious trouble. An occasional verbal reprimand or thirty minute detention was acceptable every now and then if he got caught breaking the class rules since minor transgressions would not seriously effect his grade. However, serious trouble might lower his grade and he did not want that to happen especially in Mr. Benson's class where participation, attitude, and behavior figured into his final grade.

#3. Goal-Entertainment. Frank was board much of the time in physics class. He occasionally helped lighten things up by socializing with other students and the teacher. Socializing took the form of talking and joking. Entertaining events also served to postpone class work which relates to Role #2.

#3. Role-Dark, humorous incidents such as the baby doll hanging and the frequent sparring episodes with Mr. Benson were entertaining. Sparring with Mr. Benson might invite a series of lengthy exchanges which could side track the teacher from his intended lesson. However, Frank's sparring was more than an entertaining method to minimize class work and boredom, it was a way of signaling to Mr. Benson that his instructional strategies were inadequate for his learning.

Frank's Preferences for the Physics Teacher's Goals and Roles.

#1. Goal-Teach the subject content.

#1. Role-The teacher should offer direct classroom instruction. This means having the teacher go over problems on the front board and answer student questions about how to solve problems. A teacher should also ask content questions of students to determine their level of understanding and adjust the pace of instruction according to what students know and the rate of their learning. A teacher should enter into extended discussions with students about physics concepts to help them clear up their misunderstandings. He should have students work in small groups completing laboratory activities, and he should include content related instruction with student project activities.

#2. Goal-Concern for student.

#2. Role-The teacher's genuine concern for student's well being and their learning is evident by his willingness to effectively communicate with students and adequately prepare for instruction. This is evident as teachers talk and joke with students on their level.

A teacher should use language and be able to talk with students on their level and try to find out what motivates students to learn. Teachers should treat students in a firm, fair manner. They ought to enforce fair class rules and assignment schedules. Teachers should not let students get away with too much inappropriate behavior or grant them too much unsupervised time.

#3. Goal-Attitude towards self.
#3. Role-Teachers should be able to laugh at themselves at times and admit their errors.

Conclusions

Frank was not satisfied with Mr. Benson's teaching. He wanted Mr. Benson to take a more active role in the classroom. On occasion, Frank would engage in classroom sparring with Mr. Benson, not only to entertain and reduce boredom, but to send a message that something was wrong in the classroom. As a classroom observer, I did not readily recognize the signal until I reflected on what Frank's language meant in the context of his views on the preferred roles of the teacher.

This paper invites the reader to vicariously enter a high school physics classroom and see it from a student's perspective. Story authenticity is based on the degree of verisimilitude that the reader perceives with it. Examining learning environments from a student's perspective informs researchers and teachers of the particularized experience which may facilitate reflections on classroom life.

Many of the findings in this research are consistent with previously reported research in students' views of their learning and learning environment (Allen, 1986; Roth & Roychoudhury, 1994; Dubberley, 1988). Some readers may construct inconsistencies in Frank's goal of learning and his subsequent roles to minimize work in the classroom. To understand Frank's classroom experiences, however, I have attempted to interpret his actions in context. I have learned that connecting with learners means getting to know them by sharing experiences and developing rapport. In this paper, connecting means trying to understand the classroom learning environment based on Frank's experiences.

An interpretation of Frank's view of his classroom learning environment is reported in this paper. It is recommended that teachers and researchers connect with students in classrooms to better understand their classroom roles and goals. Listening to student talk meant more than hearing conversations, it implied constructing the intended meanings behind a student's actions. There are great potentials for researchers and teachers to better understand the teaching and learning process by examining both students' interpretations of their daily classroom experiences and the messages that students send us by what they do in class.

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